CHAPTER 32

BLAST PROTECTION AND DETECTION SYSTEM

32-1. Minimum maintenance activities for blast protection and detection systems

Blast protection and detection systems guard hardened facilities from the effects of an attack external to the facility. These systems consist of blast sensors, relay panels, blast valve systems, blast door systems, and the electrical system. The tables that follow indicate items that must be performed to maintain systems and equipment at a minimum level of operational readiness. The listed action items should be supplemented by manufacturer-recommended maintenance activities and procedures for specific pieces of equipment. Maintenance actions included in this section are for various modes of operation, subsystems, or components. Table 32-1 provides maintenance information for blast sensors and relay panels. Table 32-2 provides maintenance information for blast valve systems. Table 32-3 provides maintenance information for blast door systems.

32-2. General maintenance procedures for blast protection and detection systems

This section provides a list of minimum maintenance activities that must be performed on blast protection and detection systems. In addition, this section provides general instructions for performing the listed maintenance activities. Some equipment maintenance listed in the tables indicates that the required action is to report the status of a system or device. In these cases, the defect or discrepancy that is found cannot be corrected or repaired during the routine inspection. The facility maintenance group must plan and schedule the required repair correction.

a. Blast valve cleaning and service. There are three contributing factors to malfunctioning and deterioration of blast valves: dirt, lack of lubrication, and corrosion. Dirt, including dust, must be wiped off, and all surfaces must be kept free from oil and moisture. Dust collects on wet surfaces and forms hard coatings. Dust can combine with moisture and cause corrosion through the formation of acids, and the resultant coating would cause a reduction in bearing surface tolerances and thereby prevent optimum operation. The blast valves should be scraped and repainted, as required, to prevent deterioration. Sliding surfaces should be wiped clean and dry, then oiled and wiped lightly to remove excess oil. Non-hydraulic type blast valve spring clearances should be inspected and maintained by replacement of necessary parts. All bearings are to be lubricated with a minimum amount of lubricant, as excessive lubrication will cause a buildup of dirt and grime.

b. Hydraulic systems. All filters and strainers must be cleaned or replaced in accordance with the schedule outlined in the tables, or as indicated by system performance. Before opening a drum of hydraulic fluid, use particular care to clean the area surrounding the closure. Use a clean, lint-free wiping cloth. Use only transfer containers and hoses that have been cleaned and flushed with a recommended flushing oil prior to use. All hydraulic fluid introduced into the reservoir must be filtered through the filler strainer. Facilities using hydraulic systems may have very specific requirements for which brand and type of hydraulic fluid is acceptable for use in each system. Hydraulic fluid has unique lubricity, viscosity, seal compatibility, and temperature requirement characteristics. Be certain when adding hydraulic fluid that it is the correct brand and type. Never substitute hydraulic fluids. Hydraulic fluid breaks down after a time and combines with water and wear particles to form sludge which settles to the bottom of the reservoir. If contaminants are allowed to build up, component damage will result.

Therefore, fluid condition should be checked every six months to verify that it is suitable for further use. To check fluid condition, drain off representative samples of the fluid into clean bottles with tight fitting covers and forward it with identification and date of sample to a laboratory qualified to make a contamination analysis. If no laboratory is available, replace fluid.

(1) When visual inspection or laboratory tests indicate that the hydraulic fluid should be replaced, perform the following.

(a) Remove drain plug and drain all fluid from the reservoir.

(b) Remove access plate or cover from the reservoir.

(c) Clean interior of reservoir with solvent. Do not use rags or any material that will deposit lint to be picked up by the hydraulic fluid.

(d) Replace drain plug and fill reservoir to the high level mark.

(2) Observe the following precautions when storing the reserve supply of hydraulic fluid.

(a) Store drums of new fluid on sides rather than upright.

(b) Store drums out of the weather in a clean area.

(c) Keep containers tightly closed to avoid condensation of moisture inside and to prevent the entry of contaminants.

c. Blast door adjustments. The semiautomatic blast doors require several periodic adjustments. Typically, these adjustments are made routinely on a monthly basis. However, if the doors have been opened and closed significantly more than normal in a given period of time, these adjustments should be made more frequently. In addition, it is beyond the scope of this manual to provide specific instructions for performing each adjustment. Each facility, with semiautomatic blast doors, will have developed the specific procedures required for adjustment of the blast door systems. The adjustments required are as follows.

(1) Drive rod and chain adjustment

(2) Limit switch adjustment

(3) Electrical controls adjustment

(4) Pressure adjustment

(5) Door moving adjustment

(6) Speed control adjustment

d. Lubricate rotating equipment. Grease all zerks at the manufacturer's recommended service interval. Grease gently with a handgun to avoid damage to grease seals. Do not overgrease. Ball or roller bearings tend to heat up when overgreased and will cool down to normal running temperatures when the

excess grease either oozes out or is wiped off. The normal operating temperature of a bearing may be well above 140°F, which is "hot" to touch. Temperatures should be checked with a thermometer, and any temperature readings over 180°F should be questioned. If a drop of water placed on a bearing sizzles, the bearing is in distress and should be changed before it seizes and ruins the shaft. During equipment overhauls, bearing assemblies should be thoroughly cleaned, inspected, and adjusted in accordance with the manufacturer's recommendations. All old grease should be removed from bearings, and the bearings should be repacked with grease a minimum of every two years. For sleeve bearing assemblies with oil reservoirs, service reservoirs at the manufacturer's recommended interval with recommended viscosity lubricating oil. Do not overfill reservoir as overheating may result. When new sleeve bearing units are placed in service, drain and flush the oil reservoir after about two weeks of operation and refill the reservoir with new lubricating oil of the proper viscosity. Monitor the operation of all recently installed bearings. Check for overheating (alignment and lubrication), vibration (alignment), loose collars, fasteners, etc. Early problem detection can avoid early failure and costly replacement.

e. Packing adjustment. Occasional packing adjustment may be required to keep leakage to a slight weep; if impossible to reduce leakage by gentle tightening, replace packing. A slight weeping through the packing gland is required so that the process fluid provides lubrication for the packing material. Maintain a supply of the recommended type and size of packing required for the equipment. Do not substitute one type of packing with another without verifying the packing types are compatible. Do not use oversized packing. If diameter of oversized packing is reduced by hammering, early failure of packing may result. A too tight packing joint may interfere with equipment operation, can damage equipment, and, again, may result in early failure of the packing. The procedure to follow when replacing packing is as follows.

(1) Remove all old packing.

(2) Inspect shaft for wear and replace as required.

(3) Use proper size packing, and cut packing into rings using the shaft as a guide. When cutting to length, hold packing tightly around shaft, but do not stretch packing. Cut with a butt joint. **Do not wind packing around shaft.**

(4) Thoroughly clean shaft and housing.

(5) Install one ring at a time. Oil or grease lubrication, if permitted, will assist when packing the ring into the box. Offset joints of each succeeding ring by at least 90 degrees from the previous ring.

(6) If shaft is equipped with a lantern ring, be sure that the lantern ring is slightly behind lubrication hole in stuffing box, otherwise the lantern ring will move forward when the gland is taken up and the packing behind the ring may plug the lubrication hole.

(7) Tighten the gland bolts all the way to seat the packing. Then loosen the nuts until the nuts are finger tight. In most applications, newly installed packing should be allowed to leak freely on startup. After startup, tighten packing gland until only 2 to 3 drops a second are leaking. **Do not try to stop leakage entirely.** The leakage lubricates the packing and prevents early failure of the packing and shaft.

f. Rotating equipment clearance adjustment. After long service, the running clearances in some types of rotating equipment (fans, pumps, compressors, etc.) may increase to the point where the device is losing capacity or pressure. Resetting the clearances will normally improve performance. Check

clearances during annual inspections and adjust as required. Refer to the manufacturer's Technical Service Manual.

g. Examine internal parts of rotating equipment. Periodically (at least annually) remove casing access covers and inspect components for wear. Replacing a relatively inexpensive part after only moderate wear can eliminate the need to replace more expensive parts at a later date. Refer to the manufacturer's Technical Service Manual.

h. Flexible coupling installation and alignment. These instructions cover, in general, the installation of flexible couplings of the pin, gear, or grid types. When aligning shafts, a general rule is to align large motor shafts so the center of the motor shaft is 0.001 inch lower than the driven shaft for each 1 inch of motor shaft diameter. Turbine shafts or similar large rotating equipment, as a general rule, are set 0.001 inch lower than the driven shaft for each 1 inch of height from the mounting feet to the center of the shaft. This initial offset provides for thermal expansion of the equipment. After the equipment has been in operation long enough to reach operating temperature, the alignment of the shafts should be checked and adjusted as required.

(1) Verify that equipment the coupling is serving is completely assembled and adjusted before installing drive coupling.

(2) Install each half cover with seals on its shaft. Consult the coupling manufacturer's data to determine proper orientation of long and short shanks of coupling.

(3) For non-taper lock hub units, heat coupling to approximately 300°F by means of a hot oil bath or oven. **Do not apply flame to hub teeth.**

(4) Install coupling hubs on motor and driven shafts. Install shaft keys while hubs are still hot. Face of hub should be flush with end of shaft.

(5) Adjust the clearance between the coupling faces. Consult manufacturer's data for proper clearance. (Some coupling units may have required clearance stamped on coupling unit.)

(6) When a sleeve bearing motor is used, locate motor so that when the motor rotor is closest to the driven shaft, the motor shaft will not touch the driven shaft. If the motor shaft has a magnetic center marked, base clearance between coupling faces on magnetic center. Otherwise, determine maximum motor shaft movement and base clearance between coupling faces on one half the motor shaft movement.

(7) With tapered wedge, feeler gauges, or dial indicator verify that faces of coupling hubs are parallel.

(8) Using a straightedge or dial indicator, verify that motor and driven shafts are parallel. Shim and adjust as required.

(9) After alignment of shafts is obtained, recheck spacing between hub faces and verify that faces are parallel to within 0.001 inch.

(10) When alignment is complete, thoroughly clean both sides of the coupling and inspect all parts for damage. Install the gasket and draw the coupling flanges together keeping gasket holes in line with

bolt holes. Insert and tighten bolts, and lock washers and nuts. Lubricate coupling in accordance with the manufacturer's data.

i. Clean all equipment. Clean all equipment regularly. Clean equipment is easier to inspect, lubricate, and adjust. Clean equipment also runs cooler and looks better.

Table 32-1. Blast sensors and relay panels

Blast Sensors and Relay Panels	
Action	***Frequency***
Blast Sensors	
Inspect plenum opening for obstruction and blockage.	mo
Check pressure plate for free movement.	mo
Check microswitch for free plunger operation	mo
Check microswitch for moisture, and check moistureproofing around wiring connections.	mo
Disconnect microswitch to check with ohmmeter. When piston is depressed with appropriate force (approx. 12 pounds), the microswitch should open showing infinite resistance reading across the switch contacts. If adjustment is required, follow the procedures listed following the table section	mo
Relay Panels	
Clean external surfaces of panels. Repair rusty or corroded spots as necessary.	mo
Open panels; vacuum internal areas with a soft brush attachment.	mo
Examine internal components and wires for signs of deterioration, overheating, or corrosion. Schedule an outage for a time that would be convenient to perform work in the panel and correct deficiencies accordingly.	mo

Table 32-2. Blast valve systems

Blast Valve Systems	
Action	***Frequency***
Blast Valve Piping	
Check all hydraulic lines and fittings for condition, leakage, mounting, and security	week
Blast Valves	
Check for leakage of hydraulic fluid inside the blast valves.	week
Check hydraulic fluid level in shock absorbers. Replenish as necessary	mo
Power Units	
Check fluid level in the hydraulic power units reservoirs.	week
Drain off accumulated sludge and water from reservoir.	600 op hrs
Collect fluid samples for analysis.	6 mos
Check system hydraulic pressure on gauges at the power units.	week
Inspect discharge filters at the power units; replace as required.	week
Inspect suction strainers in pump suction lines in power unit reservoir. Clean as required.	3 mos
General	
Check for compressed air leaks in piping and valves. Noise will be a good indication.	week
Inspect compressed air filter element in supply lines to Hydraulic-Electric-Pneumatic (HEP) boxes. Replace as required.	6 mos
Inspect relay panels for loose wires and burned contacts, and to ensure that the interposing relay contacts that bypass the blast sensors are open.	week
Accumulators	
Check accumulator precharge pressure; recharge if pressure is below 1,500 psig.	mo
Power Unit Electric Motors	
Lubricate bearings.	yr
Inspect; keep motors clean and ventilation openings clear.	week
Inspect starter contacts, clean or replace as necessary	6 mos
Inspect starter wiring for cracks, cuts, and abrasions; replace as necessary and correct cause of damage.	6 mos
Valve Operators	
Cycle to insure proper operation. Visually verify valve position and check position indication at any remote panels.	mo

Table 32-3. Blast door systems

Blast Door Systems	
Action	***Frequency***
General	
Inspect the following blast door items:	
Outside surfaces of locking pins for rust.	week
Machined surfaces of doors and frames for rust.	week
For blast doors with hydraulic systems, inspect blast doors for the following:	
Check hydraulic lines and fittings for leaks. Check hydraulic filters for dirty condition; replace as required. Check reservoir oil level and oil for dirty condition.	week
Inspect pump coupling for wear, tightness, alignment, and unusual noise or excessive vibration. Check pump motor for cleanliness and overheating.	week
Check drive rod and chain for excessive slack, sprocket and chain for wear and lubrication, and cylinder mounting bolts for tightness.	week
Lubrication	
The blast door hinge bearings should be lubricated with medium weight bearing lubricating grease.	yr
The locking pins should be lubricated with a few drops of a light rust-preventive lubricating oil. Lightly lubricate all bearing and sliding surfaces. After lubricating, operate the locking pins several times to lubricate the locking pin bushings.	mo
For Manual Doors Only: Remove the hand wheel and sheet metal cover over each locking pin mechanism, and lubricate the sliding parts of the gears, guides, etc., with a medium weight grease.	2 yrs
For Hydraulically Operated Doors: With door closed, remove sprocket cover. Check sprocket teeth for wear and lightly lubricate. Lubricate chain and bearing plates. Remove chain, dip-clean in solvents, dry, and lubricate (yearly).	mo